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SPRING WHEAT PRODUCTION

**COOPERATIVE EXTENSION SERVICE
SOUTH DAKOTA STATE UNIVERSITY
UNITED STATES DEPARTMENT OF AGRICULTURE**



SPRING WHEAT PRODUCTION

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During the 10-year period, 1956-1965, South Dakota farmers annually planted an average of approximately 1,600,000 acres of hard, red spring wheat and 118,000 acres of durum wheat. South Dakota ranks third in the nation in spring wheat production from the standpoint of acres planted and bushels produced.

The goal of every South Dakota wheat farmer should be to produce high quality wheat because practically all of South Dakota's wheats are marketed for human consumption. The high-protein, strong-gluten, hard, red spring wheat is used by the milling and baking industry for making bread, rolls, hard rolls, buns, and so on. Durum wheat is used in milling high quality Semolina flour for the manufacture of macaroni, spaghetti, soup alphabets, pizza base, ravioli, vermicelli, and other forms of edible pastes.

Selecting the best wheat variety for a particular farm is important. Growing an adapted variety or varieties and one accepted by the wheat milling and baking industry insures both stable production and a marketable crop. Recommendations and the variety descriptions given in this fact sheet should help South Dakota farmers choose their varieties.

WHEAT QUALITY IS MEASURED

Quality, measured by industrial consumers of wheat, involves at least 20 considerations, which are determined in complex laboratory facilities. Such facilities usually are associated with major mills and agricultural experiment stations.

Laboratory measurements of flour quality fall into four major groupings. Hard, red, spring wheat is measured for: (1) a high content of desirable proteins, (2) a high yield of bran-free flour, (3) a flour of good dough strength suitable for mechanical mixing, and (4) a flour capable of absorbing a large amount of water and which will produce a large, uniform loaf of bread of good appearance.

For durum wheats, there are additional measurements. Amber durum, which is used in specialized products such as macaroni, must contain a high percentage of vitreous (hard texture) kernels of a clear amber color. The carotene content must be high enough for deep yellow products. This color is developed best under cool ripening conditions; weather and growing conditions influence the carotene level considerably.

The farmer and grain buyer, however, can predict wheat quality with reasonable success on the basis of (1) variety, (2) protein content, (3) test weight, (4) area or origin, and (5) freedom from foreign material. These five factors can affect the price of a bushel of wheat.

The grower can influence the quality of his crop by the choice of variety. Protein content can be raised by good soil fertility practices. Harvesting operations to help maximize test weights include swathing before the crop is dead ripe and prevention of weathering. Good storage to prevent contamination of grain by rodents, storage insects, and birds will keep down foreign material. Good management and harvesting practices will reduce the content of weed seed, sticks, and pebbles.

WHEAT FITS ROTATION

Spring wheat fits in various rotation systems. In the western and central areas where summer fallow has become a common practice, wheat is usually the first crop chosen after fallow because of its relatively high cash value. While wheat yields on fallow land seldom double yields of comparable wheat after non-fallow, the additional stored moisture and available nitrogen get the crop off to a quick start. Wheat, after fallow, benefits also from economy in operation, better distribution of labor, less chance of crop failures, and better weed control. However, the purpose of the fallowing can be defeated if the system of management fails to control wind erosion.

The next best place for wheat in rotation is after an inter-tilled or row crop that leaves the soil in condition to be prepared quickly for spring planting. Wheat yield is greater when it follows a row crop than when it follows another small grain crop. However, corn and other row crop acreages are not great in the spring wheat area, so some of the wheat acreage necessarily must follow wheat or another small grain.

SOIL FERTILITY IS IMPORTANT

Wheat, like all small grains, makes its growth in early spring when soils are still cold, and nitrogen release is low. If available plant food is lacking—especially nitrogen—the wheat plants will be yellow, have only a few or no tillers, and reach little height. This will limit the yield. Adequate soil fertility can be maintained by (1) conservation of all crop residues, (2) incorporating a grass and legume in the cropping system, (3) use of all available barnyard manure, (4) use of a green manure crop such as a sweetclover-fallow practice, and (5) wise use of commercial fertilizer. Research tests show that the protein content of wheat can be influenced by the available nitrogen in the soil.

A 20-bushel wheat crop will remove about 30 pounds of nitrogen, 12 pounds of phosphate and 7 pounds of potash per acre from the soil, assuming that the straw is being returned to the land and not burned off. South Dakota soils are high in potash, so this plant food is not a limiting factor in wheat yields. On this basis, the application of fertilizer containing about 20 to 40 pounds of nitrogen and 10 to 20 pounds of phosphate per acre would be justified.

The relationship between rainfall, soil fertility, and soil moisture reserve must be considered when applying commercial fertilizers. Recent research trials show the importance of wise use of fertilizers in successful wheat production for all areas of the

state. So far, it has not been practical to apply a nitrogen fertilizer on fallow land. However, the application of a phosphate fertilizer on fallow land has given satisfactory response. Soil tests should be made to accurately determine soil fertility levels and plant food needs. It offers a basis for making fertilizer recommendations.

An attachment on the grain drill for applying commercial fertilizers usually is preferred over the broadcast method. The attachment places the fertilizer in moist soil with, or near, the seed for immediate use by the wheat seedling.

SEEDBED PREPARATION CAN VARY

Method of seedbed preparation will vary in different areas of the state and according to the previous crop or tillage operation. Shallow cultivation of fallow will avoid excessive moisture loss by evaporation, and yet kill weeds and leave a firm, moist seedbed. Seedbed preparation and planting may be done in one operation.

Double-disking and harrowing is a common method of preparing a seedbed on row-crop land. This method is relatively cheap, fast, and leaves 3 to 4 inches of loose, friable soil on the surface with firm soil beneath. Plowing or one-waying is the usual practice when wheat follows wheat or another small grain. Sometimes corn land is also plowed, and this can help reduce the possibility of scab. Plowed land should be packed to conserve moisture and to facilitate uniform planting of the wheat seed.

The pony-press drill behind a plow and packer is a common and efficient method of seedbed preparation and planting—in a single operation. The plow, pack, and pony-press drill practice conserves moisture, plants seed in moist soil for immediate germination, and controls many common, annual weeds. It is not quite as rapid as some other methods, however.

CLIMATE DETERMINES SEEDING TIME

Wheat should be planted as soon as the soil can be worked properly with the usual farming equipment. Wheat seedlings are somewhat tolerant to cold and freezing temperatures, and early planting favors both yield and quality. Therefore, the usual practice is to plant wheat first. According to some early research trials conducted in South Dakota, the optimum seeding date for the hard, red, spring wheat is between March 15 and April 1. The optimum date for durum wheat is between April 1 and April 15. Climate will determine largely when field work will start in any given year, so no specific seeding date can be followed too closely.

SEED WHEAT WITH GRAIN DRILL

Wheat should be seeded with a grain drill. Drilling distributes the seed evenly at a uniform depth in moist soil where conditions are favorable for germination. A drill with press wheels is best, but double-disk or single-disk drills can be improved with packer wheel attachments. Pony-press drills are excellent, as noted earlier.

Hard, red, spring wheat should be seeded at the rate of about 1 bushel or 4 pecks per acre in the central and western areas and 5 pecks per acre in the eastern counties where rainfall is usually greater. The seed size of durum wheat is larger, so the rate of seeding can be increased slightly. Durum wheat is often seeded at $1\frac{1}{2}$ bushels or 6 pecks per acre in the northeast durum-growing areas. This rate of seeding is based on clean seed of high germination. If it becomes necessary to plant seed of inferior germination, the seeding rate must be adjusted.

USE GOOD SEED

Use of pure, weed-free seed of high germination is the first requirement for a successful crop. Certified seed is a farmer's best assurance of good seed, although home-grown uncertified seed can be used satisfactorily. Such seed must be carefully cleaned to remove cracked kernels, light and diseased kernels, dirt, chaff, and weed seeds.

SEED TREATMENT

Proper seed treatment with a recommended chemical is always a good practice. This treatment controls covered smut of wheat (also called "bunt" or "stinking smut") and certain other seed- and soil-borne diseases. Several good seed treatments or fungicides are on the market, and the actual cost per acre of treating is small. Custom treating is practical for some seed lots. In treating seed on the farm, follow the instructions on the seed treatment container as to rate and method of treatment. Thorough mixing of the fungicide and seed is necessary to get good seed coverage and to derive maximum benefits from the treatment. It is especially important to treat early-planted seed and all durum wheat.

CONTROL WEEDS

Weeds are often a factor in reducing wheat yields. A planned cultural weed control program should be practiced throughout the rotation and supplemented with herbicides as necessary. Wheat is quite tolerant to 2,4-D sprays.

Use 2,4-D or MCPA to control numerous broad-leaved weeds. Apply when the wheat is between

the 5-leaf and the boot stages of growth. Use the amount needed to control the weed. Rates of $\frac{1}{2}$ pound acid equivalent in ester form per acre or $\frac{1}{4}$ pound in amine form seldom cause appreciable crop damage.

Use triallate (tradename Far-go) or barban (tradename Carbyne) to control wild oats. Apply triallate pre-emergence at the rate of 1 pound (1 quart) per acre. Apply to smooth soil and incorporate to a depth of $\frac{1}{2}$ to $1\frac{1}{2}$ inches. Apply $\frac{1}{3}$ to $\frac{3}{8}$ pound active ingredient ($\frac{1}{3}$ to $\frac{3}{8}$ gallon) of barban per acre when wild oats are in 2-leaf stage or not more than 14 days after emergence. Do not feed crops sprayed with barban to livestock for at least 8 weeks after spraying.

Use bromoxynil (tradename Bromonil and Buctril) or dicamba (tradename Banvel D) to control wild buckwheat. Apply bromoxynil at rates of $\frac{1}{4}$ to $\frac{3}{8}$ pound per acre (higher rate in dry weather) when grain is in the 2-leaf to boot stage of growth. Apply $\frac{1}{8}$ pound of dicamba per acre when grain is in 2-leaf to 5-leaf stage of growth. Mix $\frac{1}{4}$ pound of MCPA per acre with the dicamba to control mustard and lamb's quarters. Do not graze areas treated with dicamba or feed forage or threshings from these areas.

HARVEST AND STORE WHEAT CAREFULLY

The most common method of harvesting spring wheat in South Dakota is the windrowing-combining sequence. Problems of weeds, uneven ripening, shattering, and high-moisture grain are eliminated. Swathing may be started when the kernels reach the hard-dough stage. Combining must be delayed until the moisture content of the wheat kernels is 13 per cent or less. Grain for long-time storage must not exceed 12 per cent moisture.

Straight combining is becoming a common harvesting method where fields are relatively weed free and the wheat ripens uniformly. The wheat crop must reach full maturity and the moisture content of the grain not over 13 per cent. Many wheat producers find that artificial drying equipment is practical when the crop is combined standing. The wheat can be combined when the grain is about 18 to 20 per cent moisture and then dried down for safe storage. This method allows earlier harvesting of the crop and eliminates any shattering losses.

Thoroughly clean the walls and floors of used bins to remove old grain. If bins are infested with grain storage insects, spray the walls and floor with an approved insecticide. Bins should be weather-proof to keep out rain and snow, and rodent and bird proof to prevent contamination. **Remember, wheat is human food—keep it clean.**

DISEASES OF WHEAT

In South Dakota, spring wheat can be attacked by about 20 recognized diseases, but not all are widespread or important in any given year. Several have caused considerable economic loss in past years.

RUST

Stem and leaf rust fungus diseases have been the most destructive diseases in recent years. Stem rust forms elongated, brick red pustules that attack both the leaves and stems. Severe stem rust infection causes low yields and test weight, poor quality and lodging. Leaf rust attacks only the leaves forming distinct circular orange-red pustules. Leaf rust occurs in most years and often reduces the yield by causing a reduction in number of kernels and in the size of the kernels. Spring wheat varieties are available which have good resistance to prevalent races of both stem and leaf rust (see table).

SMUT

This fungus disease results in two types of smutted heads known as **loose** and **stinking smut** (bunt). With loose smut, the infection is carried over from one season to another within the seed embryo, and, therefore, the disease cannot be controlled by regular seed treatment. Loose smut leaves a bare spike on the mature wheat plant as the smut mass has been dislodged during the blooming period. Stinking smut or bunt of wheat is not easily recognized in glumes, and the head remains intact. In harvesting, the smut balls are shattered, and spores thus liberated lodge on healthy kernels. Since it is seed-borne, stinking smut can be controlled by using mercury seed treatments (see Fact Sheet 193, "Seed Treatment for Small Grains").

LEAF BLIGHTS

Spot blotch is a fungus disease characterized by irregular brown to black spots on leaves and leaf sheaths. It can attack plants at any stage of their development and often results in root rot as well as head blights. The fungus is more vigorous at high temperatures than at 40° to 60° F. Early planting of spring wheat may reduce the hazards of this disease.

Septoria leaf spot is a less-frequently-occurring fungus disease but under certain conditions, it can be very damaging. It is recognized by tan to straw colored spots of varying sizes within which black pimple-like bodies can be seen. It is primarily a cool weather disease, doing its greatest damage when plants are not very active.

Bacterial leaf blight results in irregular, narrow, glossy-surfaced stripes which may be relatively short

or extend the entire length of the leaf. Often a white resinous exudate or a thin film of exudate develops on the surface of the stripes.

BLACK CHAFF

This bacterial disease occurs mainly on the chaff or glumes. It can be recognized by longitudinal, dark, more or less sunken stripes or spots, more abundant and noticeable, generally, on the upper halves of the glumes, where they often coalesce to form large spots or blotches. In moist weather tiny, yellow beads of bacteria may ooze to the surface of the black lesions and, upon drying, appear as minute, yellow scales. Some varieties appear to produce blackened glumes in certain seasons as a "varietal characteristic" which seems to be influenced by environmental conditions and not by a disease.

SCAB

Symptoms of this fungus disease occur soon after flowering causing the diseased spikelet to appear bleached or prematurely ripened while healthy spikelets are still green. Scab is more severe when wet, humid conditions exist during the flowering period. The crop will be nearly scab-free if the weather is dry. Infected kernels are shriveled and have a scabby appearance. No highly resistant varieties are available; however, certain varieties are less damaged than others (see table).

VIRUS

There are two virus diseases, **yellow-dwarf** and **wheat streak mosaic**, which are of potential concern to spring wheat growers.

Yellow-dwarf is caused by the same virus as that which produces barley yellow-dwarf and the disease known as "red leaf" on oats. On wheat this disease causes newly formed leaves to be bright yellow to pale chlorotic with the yellowing beginning at the tips of the leaves. The virus is transmitted by certain species of aphids. If infection occurs before the jointing stage, severe stunting and loss in yield can be expected. No effective measures are known for the control of yellow-dwarf on wheat. Early planting, proper soil fertilization, and good management are measures that can minimize losses.

Wheat streak mosaic is a virus disease transmitted by the wheat curl mite. It is recognized by a chlorotic streaking or a mottled yellow and green mosaic-like pattern in the leaves. In greenhouse tests spring and winter wheats are equally susceptible; however, in farmers' fields wheat streak mosaic does not appear to develop in an epidemic manner on spring wheat. It is a serious disease problem in many winter wheat areas of the state.

ROOT AND CROWN ROTS

Root rot and crown rot are caused by soil- and seed-borne fungus organisms. Plants from the seedling stage or even later are stunted, lack vigor, and are pale green, purplish, yellow or bleached. Damage occurs to individual plants or in small to large patches within fields. Affected plants are easily pulled up. The roots are often brown to black with water soaked areas. Later the roots die and slough off. Infected crown tissue is bleached, brown or black, and decayed. Under stress of wind and rain, lodging is common and may be severe. Heads may be blasted or poorly filled with a few shriveled seeds. Infected plants commonly suffer from drought. Control of root and crown rots is difficult; however, seed treatment with a mercury-containing

fungicide may be helpful. Follow good cultural practices in growing wheat including thoroughly cleaned, certified, disease- and crack-free seed of adapted varieties recommended for your area.

SELECT A VARIETY

The list of recommended varieties shown in the table is based on reliable and impartial information obtained from Experiment Station tests conducted throughout the state. These recommendations are based not only on yield but also on earliness, disease and insect resistance, straw strength, grain quality, market needs, and so forth. Variety recommendations according to crop adaptation areas are given in an annual fact sheet.

CHARACTERISTICS OF HARD RED SPRING AND DURUM WHEAT VARIETIES


CHARACTERISTICS OF HARD RED SPRING AND DURUM WHEAT VARIETIES								Disease Reaction [‡]				
HARD RED SPRING WHEAT*	Yield	Date Mature	Plant Height	Lodging Resistance	Awn Type	Bushel Weight	Quality†	Stem Rust§	Leaf Rust	Bunt	Loose Smut	Scab
Varieties Recommended												
Chris	High	Medium	Medium	Medium	Beardless	High	Satisfactory	R	R	R	R	MS
Crim	High	Medium	Medium	Medium	Bearded	Medium	Satisfactory	R	S	S	MS	S
Fortuna	Medium	Early	Medium	Good	Beardless	High	Satisfactory	R	R	MS	R	VS
Justin	Medium	Medium-late	Medium	Good	Beardless	Medium	Satisfactory	R	S	MS	MR	S
Manitou	Medium	Medium	Medium	Good	Beardless	Medium	Satisfactory	R	MR	MR	R	MS
Pembina	Medium	Medium	Medium	Good	Beardless	Medium	Satisfactory	R	MS	R	R	S
Rushmore	Medium	Early	Medium	Good	Beardless	High	Satisfactory	S	S	R	R	S
Selkirk	Medium	Medium	Medium	Good	Beardless	Medium	Satisfactory	R	MS	R	R	S
Sheridan	High	Medium-late	Tall	Fair	Bearded	High	Satisfactory†	R	R	R	R	MS
Varieties Not Recommended												
Canthatch	Medium	Medium	Medium	Good	Beardless	Medium	Satisfactory	MR	VS	R	R	S
Lee	Medium	Early	Short	Medium	Beardless	High	Satisfactory	S	S	R	S	VS
Spinkcota	High	Medium	Tall	Poor	Bearded	High	Unsatisfactory	MS	VS	MS	R	S
Thatcher	Low	Early	Short	Good	Beardless	Medium	Satisfactory	S	VS	MS	S	S
Durum Wheat												
Varieties Recommended												
Dakota	High	Early	Short	Good	Bearded	Medium	Satisfactory	R	R	R	R	S
Leeds	High	Early	Short	Good	Bearded	High	Satisfactory	R	R	R	R	S
Stewart 63	High	Late	Tall	Poor	Bearded	High	Satisfactory	R	R	S	R	S
Wells	High	Early	Short	Good	Bearded	Medium	Satisfactory	R	R	R	R	S

*Varities are listed alphabetically and not in order of importance.

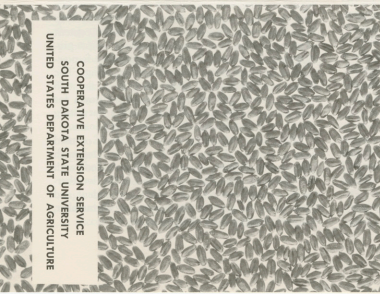
†Quality as determined by the needs of the milling and baking industry. Flour yield of Sheridan has been low in some instances according to industry tests.

‡The symbols used to indicate degree of resistance are R=resistant; MR=moderately resistant; S=susceptible; VS=very susceptible; MS=moderately susceptible.

§Resistance referred to in this column is concerned with prevalent races of stem rust.



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